WILD 540 Research Design
WILD 541 Research Design Lab

Instructors:

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Objectives and Grading

Course Objectives:

The lecture will review scientific methods, critically thinking about questions posed in research, and the approach is taken to collect data to answer them. Specifically, we will explore issues of scientific inference, examine classic experimental and survey design, explore designs for common wildlife and fisheries questions, and investigate quasi-experiments (impact assessments). In this class, students will critically review the literature, discuss specific design issues, and practice designing experiments and surveys.

The lab will introduce wildlife biology students to the R statistical analysis environment to enhance the learning objectives of the lecture. Students will be expected to learn R programming skills, R data management, and R graphing functions, as well as an introduction to statistical analysis in R. Labs will be designed to expose students to elements of research design, including basic probability theory, basic frequentist statistical approaches, sampling design, statistical power, maximum likelihood, generalized linear models and extensions.

Materials: We have a Moodle page to exchange readings, data sets, and assignments for this class. Let us know if you have any problems using Moodle.

Grading:

Participation (25%): This is a graduate class. Therefore, it will be a mix of lectures, computer labs, and discussions. We expect you to come with the assigned readings completed and ready to discuss the topic. Full credit for participation points requires regular discussion in addition to attendance.

Problem sets & assignments (50%): Throughout the semester, there will be assignments in lecture and lab that will ask you to demonstrate proficiency at R, general statistical concepts, apply issues that we discuss in class, examine outcomes of different designs, evaluate design considerations, develop sampling or experimental designs for specific problems, and comment on designs.

Class project (25%): The project for both lecture and lab will focus on your graduate student project (or similar exercise). Through a series of assignments, you will be developing the design of your project, explicitly evaluating your design's strengths, weaknesses, and power. Your work will be presented to the class for feedback at the end of the semester. This assignment counts for both the lecture and lab portion of the course.

TENTATIVE SCHEDULE and READINGS

This is a toolbox course to help you understand the array of designs, trade-offs, and approaches. These are the general topics to be covered, but the exact schedule and depth of certain topics will depend on the graduate students in the class. Lab activities will complement the lecture and assigned throughout the semester.

Week 1 - Course overview, strengthening science, and scientific inquiry

Aug 28: Class goals and introductions.

Aug 30: Scientific understanding & strengthening science (Platt 1964)

Sep 1: Need to get the basics right (Anderson 2001)

Assignment 1: Facing our common mistakes (Due Sept 7th – by email)

Week 2 - Hypotheses

Sept 4: No Class Labor Day

Sept 6: Guest Lecture Dr. Sarah Sells – hypotheses (Sells et al. 2018)

Sept 8: Developing research questions and plans

Lab 1 – continued

Week 3 - Developing plans and types of studies

Sept 11: Developing research questions and plans

Sept 13: Types of field studies and relationships with inference strength

Sept 15: Minimal requirements for experiments & pseudoreplication

Assignment 2: Delving into a research question (Due Sept 19th)

Week 4 - Experimental Designs

Sept 18:	Linking questions to designs
Sept 20:	Basic Designs - random versus fixed effects, factorial
Sept 22:	Basic Designs - Blocking, split-plot, nested and repeated measures.

Week 5 - Experimental Design

Sept 25:	Factorial Designs and Blocking
Sept 27:	Tree snail design exercise
Sept 29:	Sampling

Week 6: BACI - examples of designs from the field

Oct 2:	Sampling
Oct 4:	Dave Naugle Guest Lecture: Research Design in Large Landscape Conservation: the Sage Grouse.
Oct 6:	Sampling – large scale sampling, GRTS

Week 7: Sampling

Oct 9:	Sampling – cluster, double-sampling, etc.
Oct 11:	Student preliminary project presentations (***also during lab***)
Oct 13:	Student preliminary project presentations

Week 8: Preliminary Project Presentations

Oct 16:	Student preliminary project presentations
Oct 18:	Data Visualization Lab
Oct 20:	TBD

Week 9: Sampling and Sample Size

Oct 23:	Determining sample size
Oct 25:	Determining sample size
Oct 27:	Guest Lecture: Dr. Sara Williams – distance sampling

Week 10 – Capture-recapture

Oct 30: Capture-recapture

Nov 1: Capture-recapture

Nov 3: Capture-recapture

Week 11 – Wildlife Society Conference week

Nov 6-8: Time to work on class project (***also during lab***)

Nov 10: Veteran's Day – no classes

Week 12 – Monitoring and habitat

Nov 13: Occupancy analysis

Nov 15: Habitat Selection Analyses

Nov 17: Population Monitoring

Week 13

Thanksgiving week – no class

Week 14

Nov 27: Population Monitoring

Nov 29: Discuss Ethics of Experiments, IACUC, RCR (***during lecture***)

Final Presentations (***during lab*****)**

Dec 1: Final Presentations

Week 15

Dec 4: Final presentations

Dec 6: Final presentations (***also during lab***)

Dec 8: Final presentations

Add/drop information: Please review the add/drop information and include the relevant information for your syllabus- https://www.umt.edu/registrar/students/drop-add/default.php

Academic calendar: In case you were wondering when the semester ends- https://www.umt.edu/provost/academiccalendar/